

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY



(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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| International application No. PCT/EP2004/052259 | International filing date (day/month/year) 21.09.2004 | Priority date (day/month/year) 24.09.2003 |
| International Patent Classification (IPC) or national classification and IPC F02M31/20, F28D7/02, F28F13/06, F28F1/14 | | |
| Applicant DAYCO FUEL MANAGEMENT S.P.A.et al | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | |
| Date of submission of the demand 25.07.2005 | Date of completion of this report 19.12.2005 | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016 | Authorized Officer von Arx, H Telephone No. +31 70 340-4607  | |

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/052259

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-4 as originally filed
1a filed with telefax on 25.07.2005

Claims, Numbers

1-12 filed with telefax on 25.07.2005

Drawings, Sheets

1/2, 2/2 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☒ the claims, Nos. 13-16
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/052259

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | 1-12 |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | 1-11 |
| | No: Claims | 12 |
| Industrial applicability (IA) | Yes: Claims | 1-12 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)

International application No.

PCT/EP2004/052259

1. Reference is made to the following documents:

- D1: DE 34 43 085 A (KUEHNER GMBH & CIE) 13 June 1985 (1985-06-13)
- D2: US-A-4 938 036 (FOLEY JOHN J ET AL) 3 July 1990 (1990-07-03)
- D3: US-A-5 251 603 (KIMURA HIDEKI ET AL) 12 October 1993 (1993-10-12)
- D4: DE 37 02 963 A (SUEDDEUTSCHE KUEHLER BEHR) 11 August 1988 (1988-08-11)
- D5: FR 69 567 E (SOCIÉTÉ ANONYME DES USINES CHAUSSON) 10 November 1958 (1958-11-10)
- D6: WO 98/51923 A (BENNETT TECHNOLOGIES L L C) 19 November 1998 (1998-11-19)

2 INDEPENDANT CLAIM 1

2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows, see figures 1 and 2 (the references in parentheses applying to this document):

a cooling device for a fuel-recirculation circuit from the injection system to the tank of a motor vehicle, which has a first opening and a second opening for connection to said recirculation circuit and comprises a pipe (1) having a side wall and a finned radiant body (4) in a relationship of heat exchange with said pipe (1), end couplings (10) connected hermetically to said pipe (1), an elongated body (3) housed in a through cavity defined by said pipe (1), projections (13) radially interposed between said pipe (1) and said elongated body (3) to define internal passages traversed by said fuel, whereby said elongated body is interference fitted in said through cavity (page 6, lines 20, 21), said projections (13) are integrally formed on said elongated body (3), and said end couplings (10) are connected to said pipe (1) only.

2.2 The subject-matter of claim 1 differs from this known cooling device in that **the elongated body is made of polymeric material.**

2.3 The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

2.4 The problem to be solved by the present invention may be regarded as **"the choice**

of a material that can be used for manufacturing an elongated body in a cooling device for a fuel-recirculation circuit, be easily moulded in a single manufacturing step and be at the same time precise and lightweight".

2.5 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: **no other document from the prior art discloses or suggest the use of a polymeric material as an elongated body in a cooling device for a fuel-recirculation circuit or can be combined with the subject matter of document D1 in order to achieve the subject matter of claim 1.**

3. Claims 2 - 11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

4. INDEPENDANT CLAIM 12

4.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 12 does not involve an inventive step in the sense of Article 33(3) PCT.

Document D1 discloses a cooling device comprising the features of the preamble of independant claim 16. Although DI does not disclose explicitly the method of manufacturing the cooling device it appears that manufacturing a finned radiant body by an extrusion process, is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to manufacturing the cooling device and it would be obvious to a skilled person to mount the guide means with an interference fitting into the pipe and hermetically connect couplings to the pipe.

-1a-

US 4938036 discloses a fuel recirculation circuit according to the preamble of claim 1, which is relatively complicated and has a relatively large number of components.

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C L A I M S

1. Cooling device (1) for a fuel-recirculation circuit from the injection system to the tank of a motor vehicle, which has a first opening (8) and a second opening (8) for connection to said recirculation circuit and comprises a pipe (2) having a side wall (5) and a finned radiant body (4) in a relationship of heat exchange with said pipe (2), end couplings (6) connected hermetically to said pipe (2), an elongated body (14) housed in a through cavity (3) defined by said pipe (2), projections (15) radially interposed between said pipe (2) and said elongated body (14) to define internal passages traversed by said fuel, characterized in that said elongated body (14) is made of polymeric material and is interference fitted in said through cavity (3), in that said projections (15) are integrally formed on at least one of said pipe (2) and said elongated body (14), and in that said end couplings (6) are connected to said pipe (2) only.
2. The cooling device according to Claim 1, characterized in that said radiant body (4) comprises a plurality of fins (10) that are longitudinal with respect to said pipe (2).
3. The cooling device according to Claim 2, characterized in that said longitudinal fins (10) are arranged in spoke-like fashion with respect to said pipe (2).
4. The cooling device according to any of the preceding claims, characterized in that said elongated body (14) is coaxial to said pipe (2).
- ~~5. The cooling device according to any of the preceding claims,~~
characterized in that said elongated body (14) has at least one tapered end (11).
6. The cooling device according to any of the preceding claims, characterized in that said elongated body (14) carries said

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projections (15) in contact with said side wall (5) of said pipe (2), thus defining said internal passages.

7. The cooling device according to any of claims 1 to 5, characterized in that said pipe (2) carries said projections (15) in contact with said elongated body (14), thus defining said internal passages.

8. The cooling device according to any of the preceding claims, characterized in that said elongated body (14) has a circular cross section.

9. The cooling device according to any of the preceding claims, characterized in that said projections (15) are helical.

10. The cooling device according to any of claims 1 to 8, characterized in that said projections (15) are longitudinal.

11. The cooling device according to any of the preceding claims, characterized in that said at least one coupling (6) comprises a substantially conical portion housing a respective end (11).

12. Method for manufacturing a cooling device (1) for a fuel-recirculation circuit from the injection system to the tank of a motor vehicle, which has a first opening (8) and a second opening (8) for connection to said recirculation circuit a finned radiant body (4), a pipe (2) carried by said finned radiant body (4) in a relationship of heat exchange with said radiant body (4), and guide means (7) for guiding the flow of fuel, said guide means (7) being housed in said pipe (2) in order to define at least one path of flow of said fuel adjacent to a side wall of said pipe (2), said method being characterized by the fact of comprising the following steps:

- manufacturing said finned radiant body (4) by an extrusion process;

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- mounting with an interference fitting said guide means (7) into said pipe (2);
- hermetically connecting to said pipe (2) a first and a second coupling (6) respectively defining said first and second opening (8).